Companion modelling to mitigate land use conflict between herders and foresters in Northern Thailand

Resource management problem

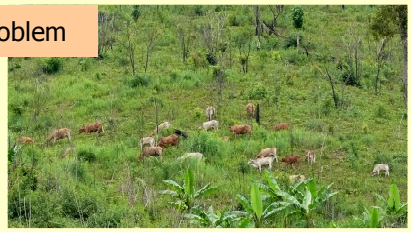


Fig. 1. Cattle grazing in a reforestation plot.

- Past top-down forest management policies such as the establishment of national parks limited farmland expansion and access to forest resources. Locally, this created land use conflicts and mistrust between farmers and government officers impeding co-management of the land.
- In the highlands of Nan province, Hmong herders and foresters have contrasted perceptions on the effects of cattle grazing on forest regeneration. Herders think that cattle grazing accelerates vegetative transitions by reducing the dry biomass causing forest fire, while foresters consider that grazing delays the forest succession through trampling and browsing of seedlings and saplings.
- There is an urgent need to facilitate dialogue and coordination between these two parties to encourage the co-management of the local social ecosystem.

Research objectives

- To improve understanding of interactions among cattle raising, reforestation efforts, and vegetation dynamics by building a shared representation of this sub-system with the concerned stakeholders.
- To improve communication, adaptive capacity, and facilitate collective decision making about land management among them…
- By constructing and using a family of multi-agent models to represent and simulate land management scenarios identified by stakeholders to support the negotiation of a common action plan.

Doi Tiew village

- Since 1961, different types of Hmong farmers have been growing upland rice, maize, litchi, and rearing cattle in forest and fallows.
- Two key forest management agencies interact with them:

- Nam Khang Headwater Research and Development Unit (NKU) established in 1990, and

- Nanthaburi National Park(NNP) preliminary delimited in 1996.

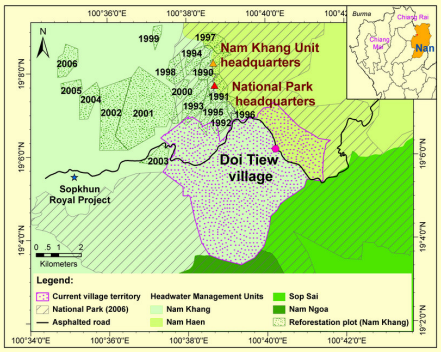


Fig. 2. Location of Doi Tiew and forest conservation areas.

Companion modelling: The process implemented at this site

- Companion modelling is a trans-disciplinary participatory modelling approach to facilitate communication, joint learning, coordination, and collective decision-making among stakeholders (www.commod.org).
- A conceptual framework based on three iterative activities (Fig 3):

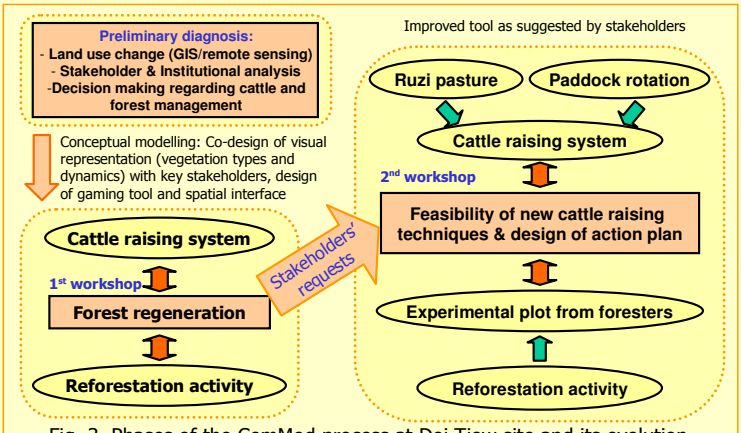


Fig. 3. Phases of the ComMod process at Doi Tiew site and its evolution.

- Diagnostic analysis and data gathering: to characterize relevant components (resources and actors), their dynamics and interactions to represent the sub-system and the conflict at stake.
- Model conception and implementation: exchanges of perceptions, knowledge sharing and integration to co-design of the vegetation transition module. Choice of virtual landscape associated to actual land use change during past years.

Fig. 4. Co-design of vegetation dynamics diagram with stakeholders.

Fig. 5. Individual interview with a key informant.

- Participatory gaming and simulation sessions based on a computer-assisted Role-Playing Game (cRPG): Players manage the land, while computer updates vegetation states based on previously agreed upon transition rules (Fig. 6).

- **First field workshop** between herders and NKU foresters to improve researchers' understanding of interactions, facilitate communication and exchange of perceptions to build a representation of vegetation dynamics influenced by grazing, reforestation, and natural growth. Players suggested improvements of the simulation tool and defined scenarios of interest to them.

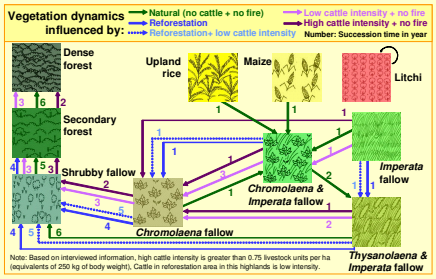


Fig. 6. Vegetation state transition diagram validated by stakeholders and used to code the model.

Fig. 7. Herders deciding land use on the spatial landscape.

- **A second field workshop** was based on players' recommendations to support the negotiation of an action plan facilitated by scenario simulations. It was included new participants: NNP rangers and district livestock development officer.
- Interviews were carried out after the workshops to understand players' decisions during the gaming sessions, and to record suggestions to improve the tools.

Results and discussion

Improved communication

- Herders and foresters were able to use their empirical experiences to manage the simplified virtual landscape effectively (Fig. 8).
- Herders were concerned by reduction in grassy areas over time, while foresters faced difficulty to select new land for reforestation. These trends stimulated them to discuss and coordinate their practices.
- They requested to simulate scenarios based on new cattle and land management techniques: seasonal paddock rotation and *Brachiaria ruziziensis* (Ruzi) pasture.

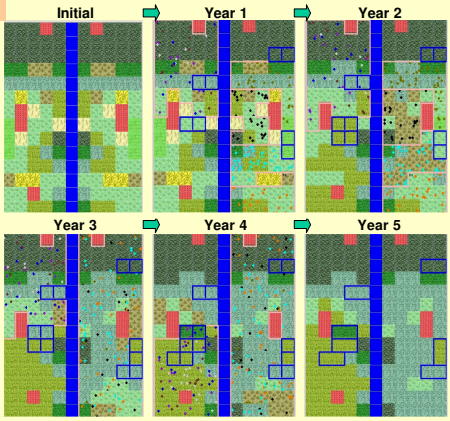
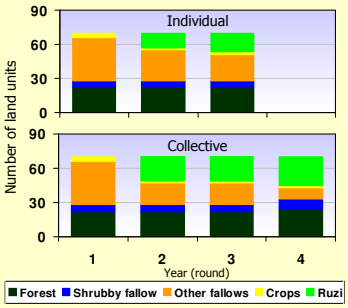


Fig. 8. Landscape dynamics based on players' strategies in a gaming session: Individual and collective management of cattle and gradual expansion of reforestation plots. *(Dots of different colours denote cattle owned by different herders, paddock, reforestation plot, see meaning of pictograms in Fig 6.)*



Co-design of an actual action plan

- Two modes of communication and cattle management were simulated: individual vs pooled herds. Collective management allowed more extensive establishment of ruzi pastures (Fig. 9).
- A 10 ha experimental plot was proposed by foresters with forage seeds provided by the district livestock development officer.

Fig. 9. Increasing proportion of Ruzi pasture in scenario with collective management of cattle.

Lessons learned and next steps

- Gaming and simulation was effective to improve communication and build a shared representation of vegetation dynamics facilitating the negotiation of a co-management action plan between herders and foresters.
- In such a process, the researcher acts as a facilitator: To construct adapted simulation tools, to maintain dialogue among actors, to answer their requests...
- The possibility to set up of an actual joint action plan demonstrated improved trust between herders and foresters.
- A fully autonomous agent-based computer model is being developed to allow less costly and more time efficient scenario simulations.

Fig. 10. Foresters and herders discuss options of a joint management action plan.

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